PATENT
Attorney Docket No. 814-067.030

WHAT IS CLAIMED IS:

1. Method for continuously manufacturing EL lamp material comprising the steps of:

coating an indium tin oxide polyester film (ITO/PET) substrate with a layer of phosphor particulate embedded in an organic binder defining a front substrate;

coating an aluminum foil polyester film laminate with a layer of barium titanate defining a rear substrate;

continuously laminating said front substrate and said rear substrate with said organic binder phosphor particulate layer facing said barium titanate layer to produce an EL lamp laminate material having an ITO front electrode and an aluminum foil rear electrode.

2. The method as defined in claim 1, wherein the step of coating the ITO/PET substrate includes the steps of:

coating the ITO surface of the ITO/PET substrate with a UV-curable organic binder;

electrostatically depositing a layer of phosphor particulate on the UV-curable organic binder surface wherein the phosphor particulate is partially embedded in the organic binder; and

setting the thickness of the UV-curable organic binder phosphor particulate layer to a predetermined desired thickness.

3. The method as defined in claim 2, further including the step of curing the UV-curable organic binder phosphor particulate layer prior to the step of laminating the front and rear substrates.

4. The method as defined in claim 2, further including the step of partially curing the UV-curable organic binder phosphor particulate layer prior to setting the thickness of the layer.

5. The method as defined in claim 1, wherein the step of coating the ITO/PET substrate includes the steps of:

coating the ITO surface of the ITO/PET substrate with a slurry mixture of a UV-curable organic binder and phosphor particulate; and

setting the thickness of the UV-curable organic binder and phosphor particulate layer to a predetermined desired thickness.

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6. The method as defined in claim 5, further including the step of curing the UV-curable organic binder phosphor particulate layer prior to the step of laminating the front and rear substrates.

7. The method as defined in claim 5, further including the step of curing the UV-curable organic binder phosphor particulate layer after the step of laminating the front and rear substrates.

8. The method as defined in claim 1, wherein the step of continuously laminating said front and rear substrates further includes embedding exposed portions of the phosphor particulate extending beyond the surface of the organic binder in the barium titanate layer.

9. The method as defined in claim 1, wherein the step of continuously laminating said front and rear substrates further includes setting the thickness of the EL lamp laminate material to a predetermined desired thickness.

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10. The method as defined in claim 1, wherein the step of coating the ITO/PET substrate includes the steps of:

coating the ITO surface of the ITO/PET substrate with a thermoplastic clear organic binder;

setting the thickness of the thermoplastic clear organic binder layer to a predetermined desired thickness;

warming the thermoplastic organic binder layer to soften it;

electrostatically depositing a layer of phosphor particulate on the softened thermoplastic organic binder surface; and

chilling the thermoplastic organic binder phosphor particulate layer to firm it prior to the laminating step.

11. Apparatus for continuously manufacturing EL lamp laminate material comprising:

means for coating a continuous coil of an indium tin oxide polyester film (ITO/PET) substrate with a layer of an organic binder;

means for depositing phosphor particulate on said organic binder, said phosphor particulate organic binder coated ITO/PET substrate defining a front substrate;

means for coating a continuous coil of an aluminum foil polyester film with a barium titanate layer, said barium titanate coated aluminum foil polyester film defining a rear substrate; and

means for laminating said front substrate and said rear substrate with said organic binder phosphor particulate layer facing said barium titanate layer to produce an EL lamp laminate material having an ITO front electrode and an aluminum foil rear electrode.

12. The apparatus as defined in claim 11, wherein said ITO/PET coating means further comprises a gravure roller for applying the organic binder layer to the ITO surface.

13. The apparatus as defined in claim 11, wherein said ITO/PET coating means applies a UV-curable organic binder layer to the ITO surface.

14. The apparatus as defined in claim 13, wherein said phosphor particulate depositing means further comprises electrostatic depositing means.

15. The apparatus as defined in claim 11, further including a calender roll for setting the thickness of said front substrate to a predetermined desired thickness.

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16. The apparatus as defined in claim 11, wherein said ITO/PET coating means further comprises a knife-over-roll apparatus for applying a slurry mixture of a UV-curable organic binder and phosphor particulate to the ITO surface.

17. The apparatus as defined in claim 13, further including the means for curing the UV-organic binder is located prior to said laminating means.

18. The apparatus as defined in claim 13, further including the means for curing the UV-organic binder is located after said laminating means.

19. The apparatus as defined in claim 11, wherein said laminating means comprises a pressure-nip laminator.

20. The apparatus as defined in claim 11, wherein said laminating means comprises a heated-nip laminator.

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21. Method for continuously manufacturing EL lamp material comprising the steps of:

providing a continuous roll of an indium tin oxide coated polyester film ITO/PET substrate of indeterminate length and width;

coating the indium tin oxide surface of said ITO/PET substrate with a UV-curable organic binder layer;

depositing a layer of phosphor particles in the UV-curable organic binder layer;

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partially curing said phosphor particle deposited UV-curable organic binder layer;

setting said UV-curable organic binder phosphor particle layer to a predetermined desired thickness;

curing said UV-curable organic binder phosphor particle layer, said ITO/PET cured organic binder phosphor particle substrate defining a front electrode laminate;

providing a continuous roll of an aluminum foil polyester film laminate of indeterminate length and having a width substantially equal to the width of said ITO/PET substrate;

coating the aluminum foil surface of said aluminum foil polyester film laminate with a barium titanate layer, said barium titanate coated aluminum foil polyester film laminate defining a rear electrode laminate; and

continuously joining said front electrode laminate and said rear electrode laminate with said organic binder phosphor particle layer facing said barium titanate layer to produce a continuous roll of EL lamp laminate material.

22. The method as defined in claim 21, further including the step of removing foreign matter from the indium tin oxide surface prior to coating with the UV-curable organic binder layer.

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23. The method as defined in claim 21, wherein the step of coating the UV-curable organic binder layer further includes direct gravure coating onto the indium tin oxide surface.

24. The method as defined in claim 21, wherein the step of coating the UV-curable organic binder layer further includes indirect gravure coating onto the indium tin oxide surface.

25. The method as defined in claim 21, wherein the step of coating the UV-curable organic binder layer further comprises coating the UV-curable organic binder layer in a thickness in the range of about 0.3 mils to 0.8 mils.

26. The method as defined in claim 21, wherein the step of depositing a layer of phosphor particles further includes the step of electrostatically depositing phosphor particles of like electrical polarity charge onto the surface of the UV-curable organic binder layer.

27. The method as defined in claim 26, further including discharging the electrical charge from the phosphor particles deposited on the UV-curable organic binder layer.

28. The method as defined in claim 26, wherein the step of depositing a layer of phosphor particles further includes depositing phosphor particles having a microencapsulated inorganic coating.

29. The method as defined in claim 28, wherein the microencapsulated inorganic coating is aluminum oxide.

30. The method as defined in claim 28, wherein the microencapsulated inorganic coating is aluminum nitride.

31. The method as defined in claim 21, wherein the step of setting the thickness of said UV-curable organic binder phosphor particle layer further includes passing the partially cured organic binder phosphor particle layer ITO/PET substrate through at least one calender roll.

32. The method as defined in claim 31, further including the step of heating the calender roll to soften the partially cured organic binder to more easily reposition the phosphor particles.

33. The method as defined in claim 21, wherein the step of coating the UV-curable organic binder further comprises coating with a clear, UV-curable organic binder.

34. The method as defined in claim 32, wherein the organic binder is moisture resistant.

35. The method as defined in claim 33, wherein the organic binder has a dielectric constant in the range of about greater than 4, a dissipation factor in the range of about less than 0.125, and a dielectric strength in the range of about 1000 +/- 200 volts per mil.

36. The method as defined in claim 21, wherein the step of continuously joining the front and rear electrodes further comprises passing the front and rear electrodes through a nip laminator.

37. The method as defined in claim 36, further comprising the step of heating the nip laminator.

38. The method as defined in claim 21, further comprising the steps of:

cutting the rear electrode laminate into at least one pair of parallel strips; and

continuously joining said front electrode laminate and said parallel strip pair of rear electrode laminate to produce a continuous roll of split-electrode EL lamp laminate material.

39. The method as defined in claim 21, further comprising the steps of:

cutting the rear electrode laminate into at least two pairs of parallel strips;

continuously joining said front electrode laminate and said at least two pairs of parallel strips rear electrode laminate; and

cutting the continuously joined front and rear electrode laminate along a line defined by adjacent pairs of parallel strips of rear electrode laminate to produce a continuous roll of split-electrode EL lamp laminate material corresponding to each pair of parallel rear electrode laminate strips.

40. An electroluminescent (EL) lamp material comprising:

a front electrode laminate comprising an indium tin oxide layer coated on a polyester film, an organic binder layer coated on said indium tin oxide layer and a layer of phosphor particles deposited on said organic binder layer;

a rear electrode laminate comprising an aluminum foil polyester film and a barium titanate layer coated on said aluminum foil; and

a laminate of said front electrode laminate and said rear electrode laminate, said organic binder layer facing said barium titanate layer to form the EL lamp laminate material.

41. The EL lamp material as defined in claim 40, wherein said organic binder is a UV-curable organic binder and said organic binder phosphor particle layer is set to a predetermined thickness prior to laminating said front and rear electrode laminates.

42. The EL lamp material as defined in claim 40, wherein said EL lamp material is cut to a desired arbitrary size and shape and further comprises said rear electrode being cut to a predetermined depth through said aluminum foil polyester film and partially into said barium titanate layer to produce a split-electrode EL lamp having at least two electrically isolated rear electrode areas.

43. The EL lamp material as defined in claim 42, further comprising said rear electrode being cut to a predetermined depth through said aluminum foil polyester film and partially into said barium titanate layer to produce a split-electrode EL lamp having at least two electrically isolated rear electrodes of equal area to emit light of equal brightness.

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44. The EL lamp material as defined in claim 42, further comprising said rear electrode being cut to a predetermined depth through said aluminum foil polyester film and partially into said barium titanate layer to produce a split-electrode EL lamp having at least two electrically isolated rear electrodes of unequal area to emit light of unequal brightness.

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45. The EL lamp material as defined in claim 42, further comprising said rear electrode having multiple cuts to a predetermined depth through said aluminum foil polyester film and partially into said barium titanate layer to produce a split-electrode EL lamp having multiple pairs of electrically isolated rear electrode areas wherein light is emitted in the area of each pair of multiple pairs to produce special effect lighting.

46. The EL lamp material as defined in claim 42, further comprising each of said at least two electrically isolated rear electrode areas having an electrical connector in contact with said aluminum foil for powering the EL lamp.

47. The EL lamp material as defined in claim 40, wherein said EL lamp material is cut to a desired arbitrary size and shape and further comprises said laminate having dual scribe lines along a marginal peripheral region cut to predetermined depths through said laminate, wherein the first of said dual scribe lines is outward of the dual scribe lines and is cut completely through said rear electrode laminate and said phosphor particle organic binder layer terminating at said indium tin oxide layer, and the second of said dual scribe lines cut to a predetermined depth through

said aluminum foil polyester film and partially into said barium titanate layer to produce a parallel-plate EL lamp.

48. The EL lamp material as defined in claim 47, wherein the laminate region between the first scribe line and the laminate outer peripheral edge further includes an electrical connector through said laminate and in electrical contact with said indium tin oxide for powering said front electrode defining one plate of the parallel plate EL lamp.

49. The EL lamp material as defined in claim 47, wherein the laminate region between the second scribe line and the laminate outer peripheral edge opposite said laminate outer peripheral edge outward of said first scribe line further includes an electrical connector through said laminate and in electrical contact with said aluminum foil for powering said rear electrode defining the other plate of the parallel plate EL lamp.

50. The EL lamp material as defined in claim 47, further comprising said first scribe line being flooded with a conductive material.